NORTH SHORE – LONG ISLAND JEWISH HEALTH SYSTEM

NORTH SHORE UNIVERSITY HOSPITAL

300 COMMUNITY DRIVE, MANHASSET, NEW YORK, 11030 • (516) 562-0100

PATIENT NAME: [redacted]
DATE OF OPERATION: 04/15/2008
MEDICAL RECORD #: [redacted]
ENCOUNTER #: 500003716841
SURGEON: THOMAS H MILHORAT, MD

OPERATIVE REPORT

FIRST ASSISTANT: PAOLO A BOLOGNESE, MD (051771)

PREOPERATIVE DIAGNOSIS: Tethered cord syndrome with age-matched elongation of brain stem (56.2mm), downward displacement of medulla and terminal thoracic syrinx, in association with Chiari I malformation (small posterior cranial fossa volume, large foramen magnum, tonsillar herniation to C2), and Ehlers-Danlos syndrome (Beighton score 7, with negative morphometrics for functional cranial settling).
POSTOPERATIVE DIAGNOSIS: Same; ultrathin dura with L3-L5 midline ectasia.
NATURE OF OPERATION: Spinal cord untethering under color Doppler ultrasonography and fluoroscopic guidance, consisting of an L4 laminectomy; L3 and L5 laminotomies; dural opening; resection of arachnoid membrane; microneurolysis of cauda equina nerve roots; electrophysiological mapping of the cauda equina (0.7 milliamperage power); electrophysiological stimulation of the filum terminale (0.7 milliamperage power); microsurgical section of the filum terminale; dural closure with reinforcement of suture line, employing autogenous paraspinal muscle graft; imbrication of L3-L5 midline dural diverticulum over suture line; and creation of an extradural blood patch.

ESTIMATED BLOOD LOSS: 30cc.
DRAINS: None.
TRANSFUSIONS: None.
SPECIMEN TO PATHOLOGY: Arachnoid membrane.

OPERATIVE PROCEDURE: After satisfactory general endotracheal anesthesia had been established, the patient was placed on the operating table in the prone position with bolsters under both shoulders and both

N33A

PATIENT NAME: [redacted]
MEDICAL RECORD #: [redacted]

hips. Prior to turning the patient, a Foley catheter and several peripheral intravenouses had been established. The patient was monitored from the beginning of anesthesia until the conclusion of the surgery with somatosensory evoked potentials and bilateral L2-S4 electromyograms.

A cross-table lateral x-ray was obtained to identify the position of the dorsal spine of L4. Once this had been accomplished, the position of the spine was marked on the flank with indelible ink. The posterior aspect of the back and buttocks was shaved with clippers, scrupulously washed with Betadine solution, and prepared with triple applications of povidone iodine. The operative field was suitably draped with sterile towels.

Under fluoroscopic guidance, a midline lumbar incision was made between the dorsal spines of L3 and L5. Skin bleeding was controlled with bipolar coagulation. The paraspinal fascia was exposed by a combination of sharp and blunt dissection. With the aid of the cutting cautery, the paraspinal fascia was incised on either side of the dorsal spines of L3-L5. The paraspinal muscles were separated from their bony attachments and retracted laterally beyond the facets. Soft tissue bleeding was controlled with bipolar coagulation.

The dorsal spine of L4 was removed with heavy spine cutters. Using a variety of fine angle punches and rongeurs, a standard, bilateral L4 laminectomy was carried out to a point just medial to the facets on either side. Bone bleeding was sealed with wax, and soft tissue bleeding was controlled with bipolar coagulation.

The superior arch of L5 and the inferior arch of L3 were under-bitten with fine angle punches to create small central laminotomies. The dorsal spines of L3 and L5 were reduced slightly with double-action rongeurs. Taken together, these steps did not effect the integrity of the L3 and L5 arches in any substantial way. Once again, bone bleeding was sealed with wax and soft tissue bleeding was controlled with bipolar coagulation.

The color Doppler ultrasound was brought to the surgical field. Baseline imaging revealed the nerve roots of the cauda equina to be taut and

PATIENT NAME: [redacted]
MEDICAL RECORD #: [redacted]

packed into multiple tight lateral bundles against the overlying dura between L3 and L5. Normal fishtail movements of the cauda equina elements with respirations were restricted. The filum terminale was identified as a thin, taut, midline structure immediately beneath the dorsal dura. The filum measured 0.4mm in transverse diameter, had an absent signal for fatty infiltration, and exhibited no movements with respirations. There was 2.0cm per second cerebrospinal fluid flow in the ventral and subarachnoid space between L3 and L5. There was no measurable cerebrospinal fluid flow in the dorsal subarachnoid space. Cerebrospinal fluid flow in the ventral subarachnoid space evidenced arterial pulsations only, with weak power and high resistance.

Under magnification vision, the dura was opened in the midline, 0.5cm above the superior arch of L5 with a #11 blade. The dural incision was extended rostrally through the midline diverticulum to a point 0.5cm below the inferior arch of L3. Exposure was achieved with traction sutures of 5-0 Gore-Tex on either side of the dural opening. These steps were carried out extra-arachnoidally.

Inspection revealed a transparent arachnoid membrane with no areas of opacity and no calcifications. The arachnoid was opened with the tip of a #11 blade. Cerebrospinal fluid was allowed to drain spontaneously. Using a variety of microdissection techniques, the dorsal arachnoid membrane was resected widely, along with occasional adhesions to various roots of the cauda equina between L3 and L5. A representative specimen of arachnoid was sent to pathology for examination.

Inspection revealed occasional fine arachnoidal adhesions joining adjacent roots of the cauda equina and extending between the roots to the filum terminale between L3 and L5. A microneurolysis was carried out using standard techniques of sharp and blunt dissection under somatosensory evoked potential and electromyographic monitoring. Eventually, all adhesions joining adjacent roots of the cauda equina and extending between the roots to the filum terminale were separated safely. These steps were carried out uneventfully, with no intrathecal bleeding and no electromyographic activity.

NORTH SHORE – LONG ISLAND JEWISH HEALTH SYSTEM
NORTH SHORE UNIVERSITY HOSPITAL
300 COMMUNITY DRIVE, MANHASSET, NEW YORK, 11030 • (516) 562-0100

PATIENT NAME: [redacted]
MEDICAL RECORD #: [redacted]

The nerve stimulator was brought to the surgical field. Using 0.7 milliamperage power, the individual roots of the cauda equina were mapped out in the usual manner. Nerve root mapping was repeated on three separate occasions.

The filum terminale was easily identifiable as a thin, taut midline structure of grayish color with a fine, tortuous vein adherent to its ventral surface. The filum was elevated over a 2-0 silk tie. Repeated stimulation of the filum terminale using 0.7 milliamperage power resulted in good contact but no activity, consistent with a non-neural structure.

Under magnification vision, the filum terminale was sectioned with microscissors, after bipolar coagulation. As soon as the filum had been divided, the cut ends retracted briskly. Once again, these steps were carried out uneventfully, with no intrathecal bleeding and no electromyographic activity.

The dura was closed with continuous, locking sutures of 5-0 Gore-Tex. Because of the ultrathin nature of the dorsal dural membrane, the suture line was reinforced with a long thin strip of autogenous paraspinal muscle, sewn in place with numerous interrupted sutures of 5-0 Gore-Tex, using an outer layer suturing technique. The lateral margins of the dural diverticulum, that measured less than 0.5cm in transverse width, were imbricated over the suture line with numerous interrupted sutures of 5-0 Gore-Tex, using an outer layer suturing technique. Once these steps had been completed, I instructed the anesthesiologist to perform a series of Valsalva maneuvers. These revealed no evidence of cerebrospinal fluid leakage.

The patient was placed in extreme reverse Trendelenburg position. This was done to inflate the lumbar theca, to eliminate intradural air that can degrade color Doppler images, and to serve as a test for cerebrospinal fluid leakage.

Once again, I instructed the anesthesiologist to perform a series of

NORTH SHORE – LONG ISLAND JEWISH HEALTH SYSTEM

NORTH SHORE UNIVERSITY HOSPITAL

300 COMMUNITY DRIVE, MANHASSET, NEW YORK, 11030 • (516) 562-0100

PATIENT NAME: [redacted]
MEDICAL RECORD #: [redacted]

Valsalva maneuvers. These revealed no evidence of cerebrospinal fluid leakage.

The patient was returned to the neutral position. The color Doppler ultrasound was returned to the surgical field. Final imaging revealed the nerve roots of the cauda equina to be greatly relaxed and evenly spaced throughout the lumbar theca between L3 and L5. Vigorous fishtailmovements of the cauda equina elements with respirations were observed. The distracted ends of the filum terminale were separated by a distance of 4.2cm. There was 3.0cm per second cerebrospinal fluid flow in the dorsal and ventral subarachnoid spaces and in numerous streams between individual nerve roots of the cauda equina between L3 and L5. Cerebrospinal fluid flow evidenced arterial, venous, and respiratory variations, with a good diastolic pattern, bidirectional movement, laminar flow, high-power, and low resistance (optimal).

Exposed dura was covered with thin strips of Surgicel. To this autogenous blood was anointed to create a mini blood patch. The blood patch was allowed to solidify.

The wound was irrigated with streptomycin containing solution until all returns were clear. A myofascial dissection was carried out in the usual manner to relax the muscle and fascial layers for closure.

The paraspinal muscles and paraspinal fascia were closed separately with numerous interrupted sutures of 2-0 Vicryl. The subcutaneous and subcuticular layers were closed separately with numerous interrupted sutures of 3-0 Vicryl. The skin was approximated with simple sutures of 3-0 Nurolon.

A dry sterile dressing was applied to the wound. No drains were used.

There were no somatosensory evoked potential or electromyographic changes from baseline at the conclusion of the operation. There were no after-discharges following sectioning of the filum terminale.

NORTH SHORE – LONG ISLAND JEWISH HEALTH SYSTEM

NORTH SHORE UNIVERSITY HOSPITAL

300 COMMUNITY DRIVE, MANHASSET, NEW YORK, 11030 • (516) 562-0100

PATIENT NAME: [redacted]
MEDICAL RECORD #: [redacted]

The patient tolerated the procedure well and was taken directly to the pediatric intensive care unit in good condition.

Electronically Signed by: THOMAS H MILHORAT 04/21/2008 10:48:37 PM

DICT: THOMAS H MILHORAT, MD (051623) 04/15/2008
TRANS: ST/KES 04/15/2008
JOB: 613076

N33A